The University of Southern Queensland  
Course Specification

Description: Mathematics Tertiary Preparation Level D

<table>
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<tr>
<th>Subject</th>
<th>Cat-Nbr</th>
<th>Class</th>
<th>Term</th>
<th>Mode</th>
<th>Units</th>
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<td>TPP</td>
<td>7184</td>
<td>14009</td>
<td>2, 2002</td>
<td>EXT</td>
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Academic Group: OPACS  
Academic Org: OPACSP  
HECS Band: 2  
ASCED Code: 010199

STAFFING
Examiner: Janet Taylor  
Moderator: Linda Galligan

RATIONALE
Students intending to enrol in Mathematics or some branches of computer science must be competent in certain basic mathematical topics so that they are adequately prepared for courses involving mathematics in their undergraduate studies. Furthermore they need to become reflective thinkers so that they can monitor, evaluate and control their thinking when learning and applying mathematics. This preparatory mathematics course is designed to provide students with the required mathematical competencies and to develop their metacognitive (i.e. thinking about their own thinking) skills.

SYNOPSIS
Using the principles of self-paced instruction and mastery learning, the course guides students through a carefully sequenced series of topics which provide the foundation for understanding the mathematics they will encounter in their tertiary study. A workbook approach is used and students can proceed through the modules of work at a pace suitable to their own needs. Opportunities for seeking additional assistance are provided through some of the assessment instruments used e.g. problem sets and learning diaries. Metacognitive development is encouraged through the use of specific surveys and the learning diaries. Opportunities for self assessment are provided throughout and at the end of each module.

OBJECTIVES
On successful completion of this course it is expected that a student will:

- calculate and use factorials
- find combinations using a tree diagram
- calculate and use a number of possible combinations
• know and apply the Binomial Theorem
• understand recurrence relations
• find the general term of a sequence or a series
• determine if a series has a finite sum
• recognise arithmetic and geometric series
• find partial sums and sums to infinity of geometric series
• understand the process of mathematical induction
• use mathematical induction to verify mathematical statements

Module 2
• represent inequalities on the real number line
• express inequalities in interval notation
• perform operations on inequalities
• solve inequalities
• represent linear inequalities graphically
• graphically solve simple linear programming problems
• factorise quadratic expressions
• apply the technique of completing the square
• draw graphs of rational functions
• decompose rational functions into partial fractions
• know the graphs of some common non-linear functions
• solve simultaneous equations algebraically and graphically
• find and sketch inverse algebraic functions
• prove if a function is continuous at a given point

Module 3
• use matrices to organise data
• identify any element of a matrix
• add and subtract matrices of appropriate dimensions
• multiply a matrix by a scalar
• multiply two matrices of appropriate dimensions
• identify a square matrix, the identity matrix, a zero matrix
• find the transpose of a matrix
• express linear equations in matrix form
• solve a system of linear equations using matrix manipulations
• find the inverse of an appropriate matrix using row reduction

Module 4
• express any angle in degrees or radians
• convert Cartesian co-ordinates to polar co-ordinates and vice versa
• know the common trigonometric identities
• know the common multiple angle relationships
• know the graphs of sin \(x\), cos \(x\) and tan \(x\), and their reciprocal functions
• draw the inverse trigonometric functions
• find the period of appropriate functions
• identify the amplitude of appropriate functions
• know and use the sine rule and cosine rule
• know the sine and cosine rules for compound angles and double angles
• solve graphically equations involving trigonometric functions and other types of functions
• use trigonometry to solve problems

Module 5
• identify if a function is not differentiable at a given point
• perform differentiation from first principles
• know and use the basic rules of differentiation
• know and use the chain, product and quotient rules for appropriate combinations of functions
• determine maximum, minimum and points of inflection of a function
• use calculus for curve sketching
• solve rates of change problems
• use Newton's method for finding roots of an equation Module 6
• understand the relationship between differentiation and integration
• perform anti-differentiation using "guess-and-check"
• integrate functions by substitution of algebraic or trigonometric functions
• use a Table of Standard Integrals
• perform definite integration using the Fundamental Theorem of Calculus
• perform numerical integration using the trapezoidal rule and Simpsons Rule

TOPICS

<table>
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<tr>
<th>Description</th>
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<td>2. Algebra, functions and geometry</td>
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<td>3. Matrices</td>
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<td>4. Trigonometry</td>
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<td>5. Differentiation</td>
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<td>6. Integration</td>
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TEXT and MATERIALS required to be PURCHASED or ACCESSED:

Books can be ordered by fax or telephone. For costs and further details use the 'Book Search' facility at http://bookshop.usq.edu.au by entering the author or title of the text.

All required textbooks for this course will be provided by OPACS. Student will need to acquire a scientific calculator. Student will need access to a computer.
## ASSESSMENT DETAILS

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<tr>
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<th>Wtg(%)</th>
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<td>EXAMINATION 3 HOURS</td>
<td>100.00</td>
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**NOTES:**

8. Examination date will be available during the semester. Please refer to the examination timetable when published.

## OTHER REQUIREMENTS

1. Students must perform satisfactorily in all aspects of the assessment to obtain a pass in the course.
2. Students will be required to submit extra work for each assignment which is deemed unsatisfactory.
3. Students who do not meet the necessary requirements to obtain a passing grade may, under special circumstances, be granted a supplementary examination or assignments as appropriate.
4. Supplementary examinations will usually be held in the designated university assessment period at the end of the following semester.
5. Students who, because of special circumstances have been unable to complete the course, may be eligible for special consideration if a request for such consideration is received in writing by the examiner before the date of the examination.